ABSTRACT

(Figure 10)

Position Location

Method and Apparatus for a

Mobile Telecommunications System

In a cellular mobile telecommunications system the position of a mobile station can be estimated in terms of its bearing and range from a cell site. A multi-element direction finding antenna at the cell site receives signals from the mobile station and a receiver circuit estimates the bearing using the relative phase of signals received at different antenna elements and estimates the range by measuring round trip delay of signals to and from the mobile station. Motion of the mobile station can introduce errors into the bearing estimate due to frequency offset and frequency spread when element sampling is non-simultaneous. Compensation for these errors is introduced by using signal samples successively received at the same antenna element to estimate Doppler frequency offset and spread. It is necessary to ensure accurate calibration of the direction finding antenna and the receiver circuit. This is done by injecting calibration signals into the circuit near the antenna or into the antenna itself from a near field probe. Other aspects of calibration, such as antenna position, are calibrated using a remote beacon. A beacon emulating a mobile station but at a fixed, known location, or a beacon at an adjacent cell site may be used.